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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/734,197	12/15/2003	Chin-Cheng Chien	025796-00013	4786

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EXAMINER
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DUONG, KHANH B

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 03/28/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/734,197

Applicant(s)

CHIEN ET AL.

Examiner

Khanh B. Duong

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 January 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Amendment***

This Office Action is in response to the amendment filed January 5, 2006.

Accordingly, claims 1 and 11 were amended.

Currently, claims 1-20 remain pending.

### ***Response to Arguments***

Applicant's arguments with respect to the amended claims have been considered but are moot in view of the new ground(s) of rejection under the previously cited references to Kwon and Murthy and the newly cited reference to Lee (US 2002/0151145 A1).

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

**Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kwon (US 2003/0025163 A1) in view of Murthy et al. (US 6,541,343) and Lee et al. (US 2002/0151145 A1).**

Kwon discloses in Figs. 6-11 a method of forming a semiconductor device using selective epitaxial growth, comprising: providing a semiconductor substrate 200 with a first conductivity; forming a plurality of isolation regions 202 on said semiconductor substrate 200; sequentially forming a gate dielectric layer 204 and a gate electrode 206 on said semiconductor substrate 200 between each pair of said isolation regions 202; forming a lightly doped drain region 212 with a second conductivity opposite to said first conductivity in said semiconductor substrate 200 between said gate electrode 206 and each said isolation region 202; forming a first (offset) spacer 214a around said gate dielectric layer 204 and said gate electrode 206; forming a source/drain region 226 with said second conductivity beside said lightly doped drain region 212 in said semiconductor substrate 100; performing a baking process with hydrogen ambient gas at a temperature of 900°C prior to said selective epitaxial growth process; performing a selective epitaxial growth process to form a semiconductor layer 224 on said gate electrode 206, said source and drain regions 226; forming a metal layer 228 on said semiconductor layer 224; and performing a salicide process to form a silicide layer 224a on said gate electrode 206, said source and drain regions 226.

Re claims 1-20, Kwon fails to disclose: performing a dry etching process with a carbon-free plasma source to remove a portion of said semiconductor substrate; performing the baking process with hydrogen ambient gas at a temperature of 750°C; and forming a pocket region by angle implanting said semiconductor substrate with said first conductivity on the interface of said

lightly doped drain region, said source and drain regions and said semiconductor substrate and under said lightly doped drain region without surrounding said lightly doped drain region, wherein a dosage of said pocket region is less than that of said lightly doped drain region.

Murthy suggests in FIG. 2 to 3 performing a dry etching process with a carbon-free plasma source ( $\text{SF}_6$  diluted with ambient gas comprising He) to remove a portion of said semiconductor substrate 201 for the purpose of cleaning the surface of the substrate 201 prior to forming a silicon epitaxial layer 216 [see col. 5, lines 18-32 and 55-60]. Murthy further discloses performing the dry etching process at a pressure between 200 to 300 mTorr and a power between 25 to 100 Watts [see col. 5, lines 23-32]. However, Murthy does not show forming a pocket region by angle implanting said semiconductor substrate with said first conductivity on the interface of said lightly doped drain region, said source and drain regions and said semiconductor substrate and under said lightly doped drain region without surrounding said lightly doped drain region, wherein a dosage of said pocket region is less than that of said lightly doped drain region.

Lee et al. ("Lee") suggests in FIG. 5 forming a pocket ("halo") region (28a, 28b) by angle implanting a semiconductor substrate 12 with a first conductivity on the interface of a lightly doped drain region (26a, 26b), said source and drain regions and said semiconductor substrate 12 and under said lightly doped drain region without surrounding said lightly doped drain region, wherein a dosage of said pocket region ( $5 \times 10^{13}/\text{cm}^2$  to  $5 \times 10^{14}/\text{cm}^2$ ) is less than that of said lightly doped drain region ( $1$  to  $4 \times 10^{15}/\text{cm}^2$ ) [see page 2, paragraphs 0018 to 0019].

Since Kwon, Murthy and Lee are all from the same field of endeavor, the purposes disclosed by Murthy and Lee would have been recognized in the pertinent prior art of Kwon.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the dry etching process of Murthy to the process of Kwon because of the desirability to provide the substrate with a clean surface free of contaminants prior to growing the epitaxial silicon layer. In addition, it would have been obvious to one of ordinary skill in the art at the time the invention was made to apply the angled pocket implant process of Lee to the process of Kwon because of the desirability to direct the implanted impurities below the edges of the gate electrode in order to improve the threshold voltage and the punch-through device characteristics.

Re further claims 4-10 and 14-18, Kwon, Murthy and Lee do not mention the specific ranges of process parameters for temperature, volume ratio, pressure, power, time and thickness as claimed.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to optimize and select specific ranges of process parameters as claimed. The selection of parameters such as energy, power, concentration, temperature, time, depth, thickness, etc., would have been obvious and involve routine optimization which has been held to be within the level of ordinary skill in the art. "Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may be impart patentability to a process if the particular ranges claimed produce new and unexpected result which is different in kind and not merely degree from results of prior art ... such ranges are termed 'critical ranges' and the applicant has the burden of proving such criticality ... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or

workable ranges by routine experimentation". *In re Aller*, 105 USPQ 233, 235 (CCPA 1955).

See also MPEP 2144.05.

### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).


A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh B. Duong whose telephone number is (571) 272-1836. The examiner can normally be reached on 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Zandra Smith can be reached on (571) 272-2429. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



KBD



Zandra V. Smith  
Supervisory Patent Examiner  
20 March 2006